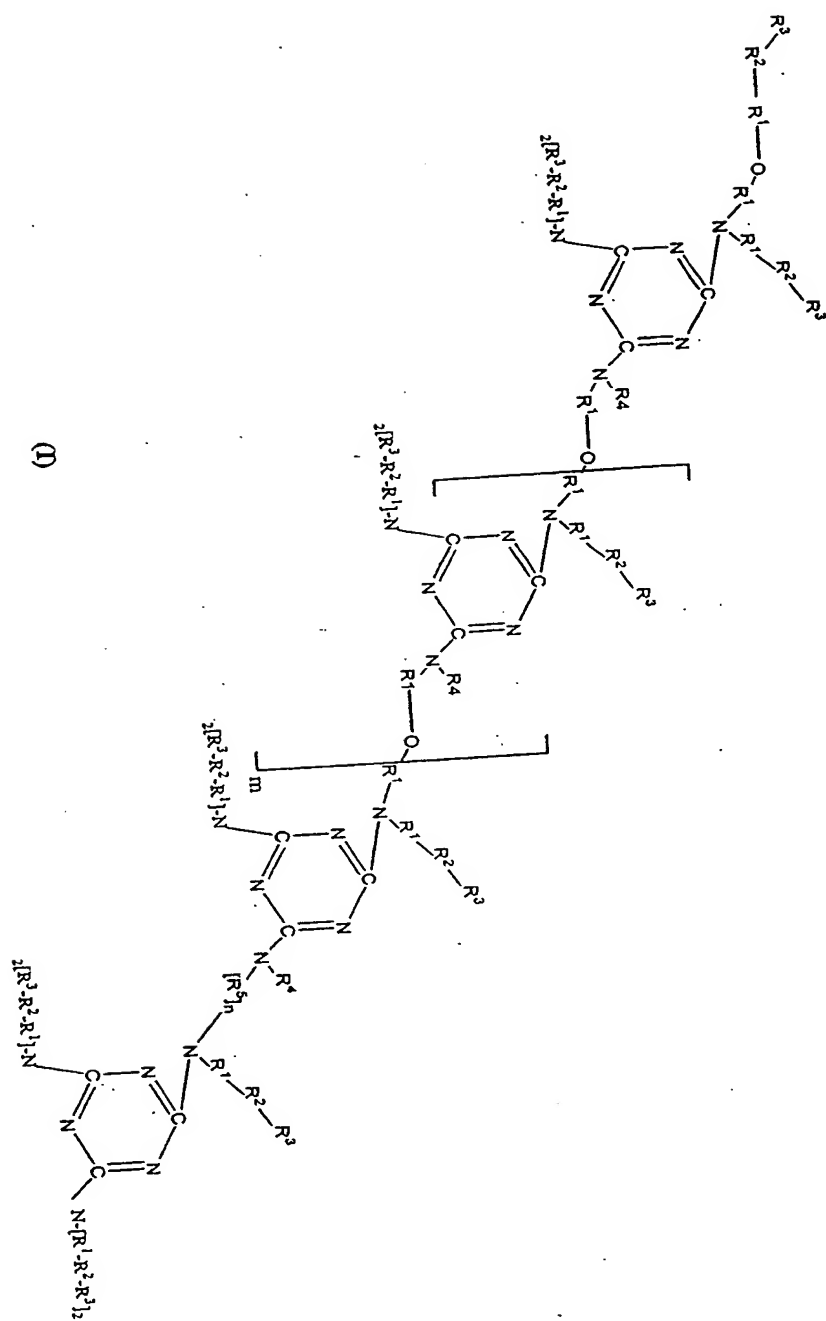


## CLAIMS

We claim:

1. A melamine ring-containing co-polymer that is the reaction product of a melamine base resin and a reactant compound, wherein the reactant compound comprises a functional group selected from a carboxyl group, a hydroxyl group and a thiol group.  
5
2. The co-polymer of claim 1, wherein the reactant compound is cardanol.
3. The co-polymer of claim 1, wherein the reactant compound is a fatty acid.
4. The co-polymer of claim 1, wherein the reactant compound is selected from the group consisting of lauric acid, myristic acid, palmitic acid, stearic acid, arachidic acid, palmitoleic acid, oleic acid, ricinoleic acid, linoleic acid, and arachidonic acid.  
10
5. The co-polymer of claim 1, wherein the reactant compound is selected from the group consisting of dodecyl mercaptan, phenyl mercaptan, lauryl thioglycolate, octyl thioglycolate, and mixtures thereof.
6. The co-polymer of claim 1, wherein the base melamine resin is selected from the group consisting of a melamine resin, a melamine-formaldehyde resin, a melamine-urea-formaldehyde resin, and a urea-formaldehyde resin.  
15
7. A melamine ring-containing co-polymer of formula (I):



wherein m is an integer of 1 to 100;

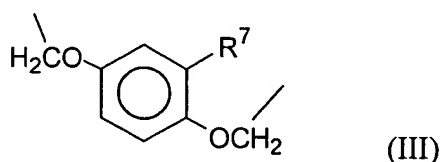
R<sup>1</sup> is independently selected from an alkyl group having one to twenty carbon atoms;

R<sup>2</sup> is independently selected from the group consisting of an oxygen atom and a sulfur atom;

5 R<sup>3</sup> is independently selected from an alkyl group, an allyl group, an alkynyl group, an aryl group, and a phenyl group, having one to seventy carbon atoms;

R<sup>4</sup> is independently selected from -C<sub>p</sub>H<sub>2p</sub>OH; -C<sub>p</sub>H<sub>2p-1</sub>OH; -C<sub>p</sub>H<sub>2p-2</sub>OH, wherein p is an integer of one to seven; a hydrogen atom; a carboxyl group, an alkyl group; an allyl group; and an alkynyl group;

10 R<sup>5</sup> is independently selected from the group consisting of an alkyl group, an alkyl group containing at least one ether linkage, and the group represented by the formula (III) :



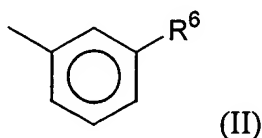
and; n is an integer of one to thirty.

8. The co-polymer of claim 7, wherein R<sup>1</sup> is independently selected from a group having two to seven carbon atoms.

15 9. The co-polymer of claim 7, wherein at least one of R<sup>3</sup> is independently selected from a group having thirty to sixty carbon atoms.

10. The co-polymer of claim 7, wherein at least one of R<sup>3</sup> is independently selected from a group having six to twelve carbon atoms.

20 11. The co-polymer of claim 7, wherein at least one R<sup>3</sup> is a structure represented by the formula (II):



wherein R<sup>6</sup> is independently selected from an alkyl group, an allyl group, and an alkynyl group having ten to forty carbon atoms.

12. The polymer of claim 11, wherein R<sup>6</sup> is a group having fifteen to thirty carbon atoms.

13. The co-polymer of claim 11, wherein  $R^6$  is a group selected from  $-(CH_2)_7CH=CH-(CH_2)_5CH_3$ ;  $-(CH_2)_7CH=CHCH_2CH=CH(CH_2)_2CH_3$ ;  $-(CH_2)_7CH=CHCH_2CH=CHCH_2CH=CH_2$ ; and  $-(CH_2)_{14}CH_3$ .

14. A method of preparing a melamine ring-containing co-polymer comprising reacting a melamine base resin with a reactant compound, wherein the reactant compound comprises a functional group selected from a carboxyl group, a hydroxyl group and a thiol group.

15. The method of claim 14, wherein the reaction is carried out in the presence of a proton-donating catalyst.

16. The method of claim 15, wherein the catalyst is a sulfo radical containing catalyst.

17. The method of claim 15, wherein the catalyst is selected from the group consisting of methanesulfonic acid, phosphoric acid, nitric acid, oxalic acid, maleic acid, hexamic acid, phthalic acid, acrylic acid, para-toluene sulfonic acid, dinonyl naphthalene sulfonic acid, magnesium bromide, zinc nitrate, aluminum nitrate, and magnesium nitrate.

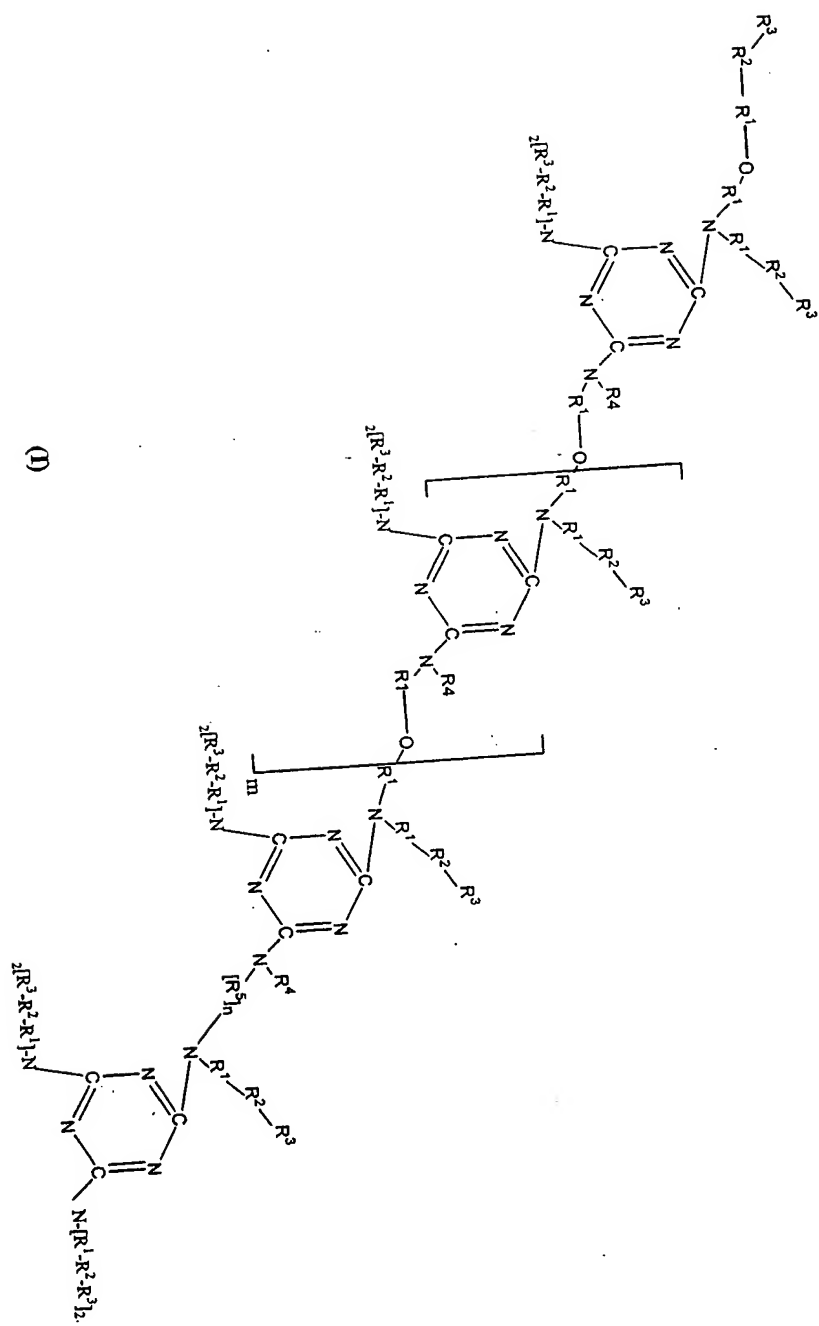
18. The method of claim 14, wherein the reactant compound is cardanol.

19. The method of claim 14, wherein the reactant compound is a fatty acid.

20. The method of claim 14, wherein the reactant compound is selected from the group consisting of lauric acid, myristic acid, palmitic acid, stearic acid, arachidic acid, palmitoleic acid, oleic acid, ricinoleic acid, linoleic acid, and arachidonic acid.

21. The method of claim 14, wherein the base melamine resin is selected from the group consisting of a melamine resin, a melamine-formaldehyde resin, a melamine-urea-formaldehyde resin, and a urea-formaldehyde resin.

22. A surface having a coating, wherein the coating comprises a melamine ring-containing co-polymer having the structure of formula (I):



wherein m is an integer of 1 to 100;

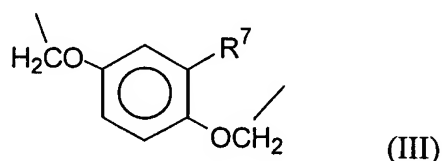
$R^1$  is independently selected from an alkyl group having one to twenty carbon atoms;

$R^2$  is independently selected from the group consisting of an oxygen atom and a sulfur atom;

- 5  $R^3$  is independently selected from an alkyl group, an allyl group, an alkynyl group, an aryl group, and a phenyl group, having one to seventy carbon atoms;

$R^4$  is independently selected from  $-C_pH_{2p}OH$ ;  $-C_pH_{2p-1}OH$ ;  $-C_pH_{2p-2}OH$ , wherein p is an integer of one to seven; a hydrogen atom; a carboxyl group, an alkyl group; an allyl group; and an alkynyl group;

- 10  $R^5$  is independently selected from the group consisting of an alkyl group, an alkyl group containing at least one ether linkage, and the group represented by the formula (III) :



and; n is an integer of one to thirty.